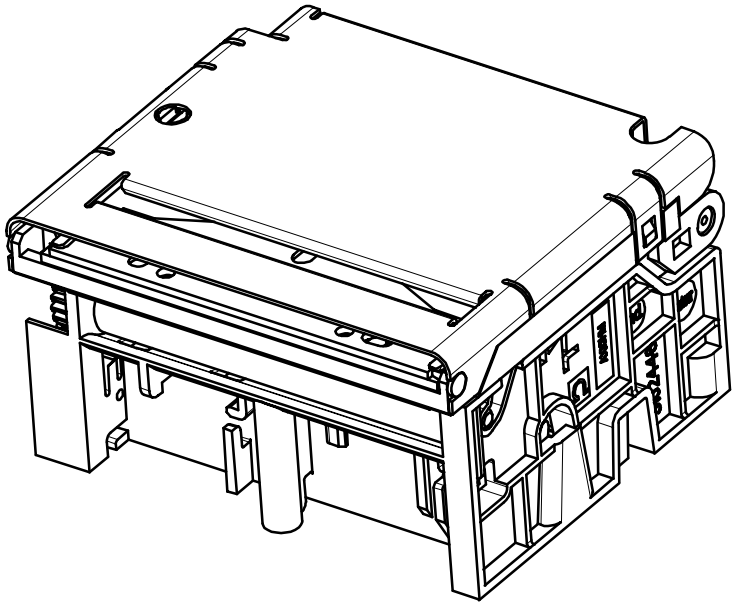
THERMAL PRINTER COMPONENTS

# CM/RMDG MINI-PRINTER SERIES
# 60 mm PRINTER MECHANISM

# USER MANUAL

Reference 3105978 Issue A
October 2003



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# EVOLUTIONS

| Date | Issue | Modifications |
|---|---|---|
| 05/00 | Z | Creation |
| 10/03 | A | Update : addition of opto-sensor information ; suppression of CM/RMBC |
| | | |

# IMPORTANT

**This manual contains the basic operations for running your printer.**

**Read it carefully before using your printer.**

**Pay special attention to the chapter “Recommendations”.**

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# 1 UNPACKING

Each printer mechanism is packaged in an antistatic bag.
Observe precautions while handling in electrostatic protected areas.

# 2 OVERVIEW

Based on static thermal printing technology, the RM series is a family of user-friendly, highly reliable devices which have been specially designed to fit in minimum space.

CMxx: Printer only or printer with optional tear bar cover.
RMxx: Printer with robust guillotine cutter.

**Characteristics:**
Very small size printer and cutter
Silent mechanism
Option of 4 dots/mm or 8 dots/mm print-heads
Easy to connect (only one connector for motor, print head, opto-sensor and cutter)
Front and bottom paper introduction possible

SUMMARY OF PRINTER SPECIFICATIONS

| ITEM | VALUE | UNITS |
|---|---|---|
| Printing method | Static thermal dot line printing | - |
| Printing width | 48 | mm |
| Printing speed | 75 | mm/sec |
| Paper loading | Auto-load | - |
| Paper width | 60 | mm |
| Paper empty detection | By opto-sensor | - |
| Maximum paper thickness | 80 | µ |
| Recommended paper | 2320061 / KP 440 (60µ) | AXIOHM reference / Kanzan |
| Number of resistor dots | 384 | - |
| Resolution | 8 | dots/mm |
| Number of steps / dot line | 1 | - |
| Paper feed / dot line | 0.125 | mm |
| Head temperature detection | By Thermistor | - |
| Out of paper detection | Opto-sensor | - |
| Maximum duty cycle (*to avoid motor temperature rise*) (Max 2 "On") | 40 (see chapter Printing recommendations) | % |

| ITEM | | VALUE | | | UNITS |
|---|---|---|---|---|---|
| Storage temperature range | | - 20 to + 60 | | | °C |
| Operating temperature range | | 0 to + 50 | | | °C |
| Relative humidity range (*operating*) | | 20 to 85 *no condensing* | | | % |
| Operating voltage range Vcc (*logic*) | | 4.75 – 5.25 | | | V DC |
| Operating voltage range Vch (*dot*) | | 20 – 26.4 | | | V DC |
| Peak print head current (*all dots "on" at nominal value*) | | 8.8 | | | A |
| Current consumption: V ch (*at nominal value*) | | 23 | | | mA per resistor dot ”On ” |
| Current consumption: V cc (*at nominal value*) | | 100 | | | µA |
| Current consumption: stepping motor for paper feed | | 320 (600 bipolar) | | | mA |
| Current consumption: stepping motor for cutter | | 500 (1000 bipolar) | | | mA |
| Electrical life time* | | $10^8$ | | | pulses |
| Mechanical life time* | | 50 | | | Km |
| Cutter life time (for RMxx) | | 1 000 000 cuts (with paper reference 2320061) | | | - |
| Over all dimensions: | Height | 32 (CM) | 36 (CM w/cover) | 42.1 (RM) | mm |
| | Width | 74.5 (CM) | | 74.5 (RM) | mm |
| | Depth | 61 (CM) | 62.5 (CM w/cover) | 65.75 (RM) | mm |
| Weight (*average*) (*without paper roll*) | | 140 (CM) | | 250 (RM) | g |

*** Per AXIOHM standard test conditions (which are mainly: 24V, 25 °C, dot printing duty cycle = 30 %)**

# 3 MECHANICAL SPECIFICATIONS

## *3.1 General description*

The mechanism consists in:

- Plastic chassis
- Robust guillotine cutter (with relevant motor and switch) for RM versions
- Stepping motor
- Gear train
- Print head
- End of paper opto-sensor

## *3.2 Dimensions of the complete mechanism*

| | |
|---|---|
| Height:..... | 32 (CM) / 36 (CM with cover) / 42.1 mm (RM) |
| Depth:..... | 61 (CM) / 62.5 (CM with cover) / 65.75 mm (RM) |
| Width (without rewinder option) | 74.5 (CM) / 74.5 mm (RM) |
| Weight:..... | 140 (CM) / 250 g (RM) |

## *3.3 Mechanical views*

**Fig. 1 CM without cover dimensions**

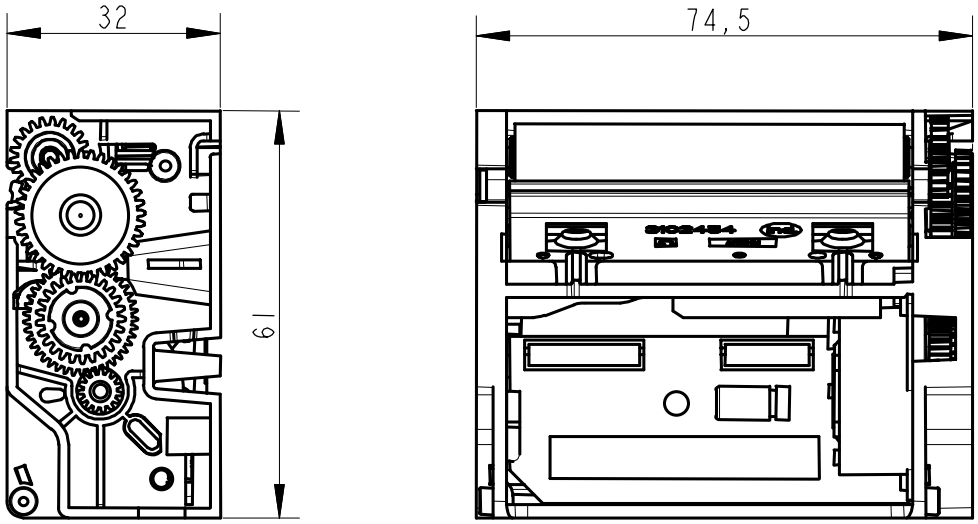


**Fig. 2 CM with cover dimensions**

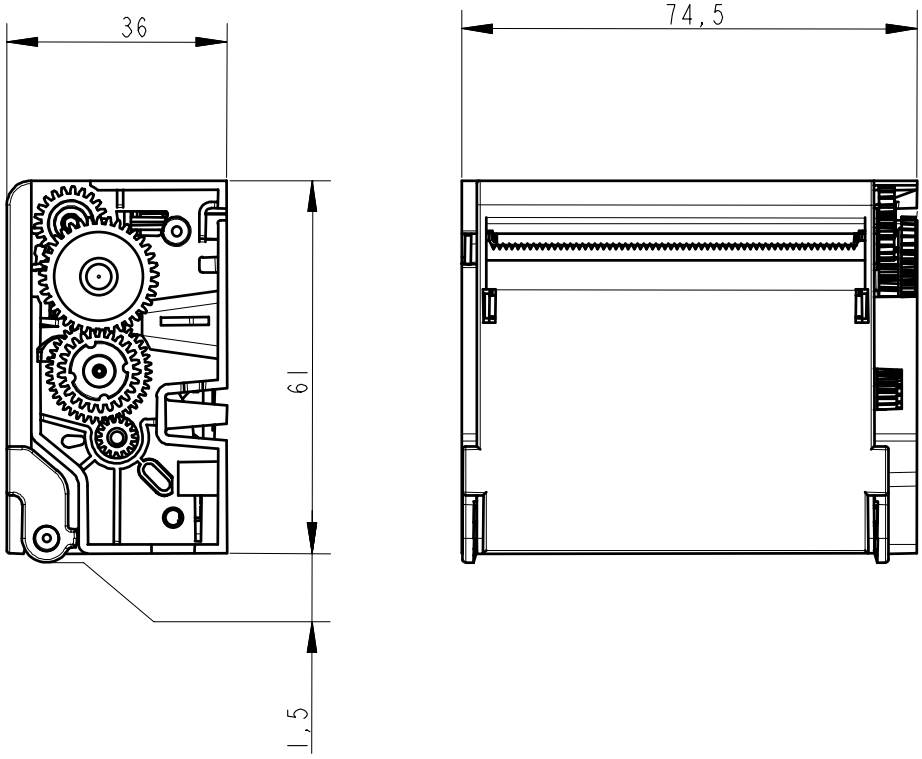



**Fig. 3 Side view with cover**

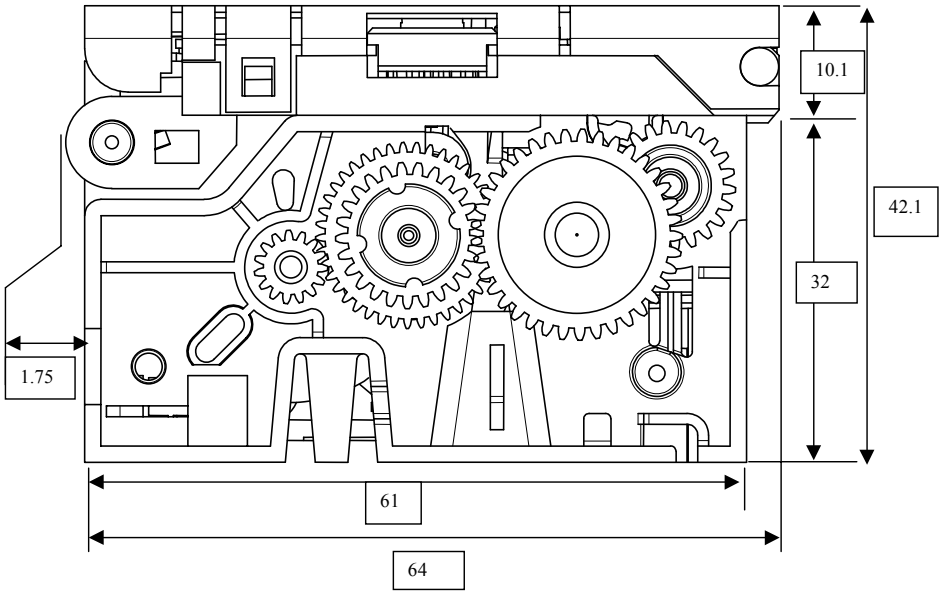


**Fig. 4 front view with cover**

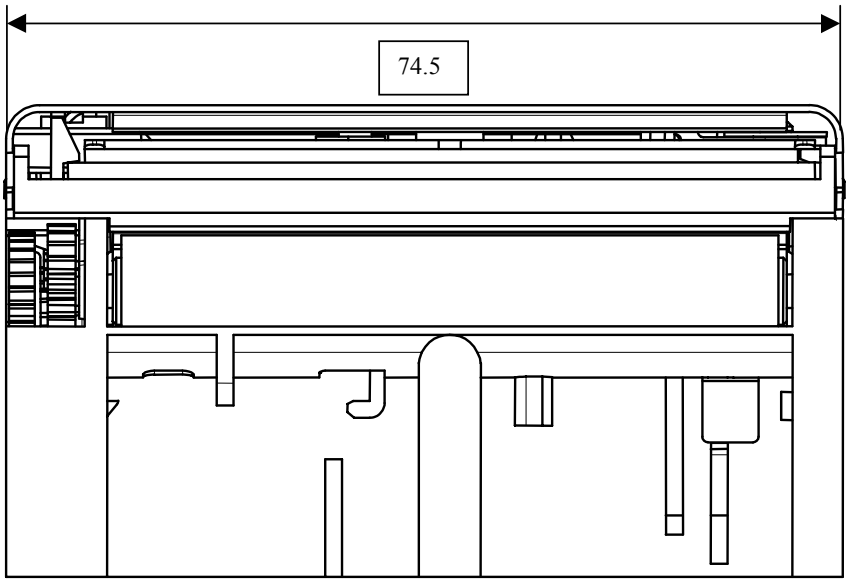
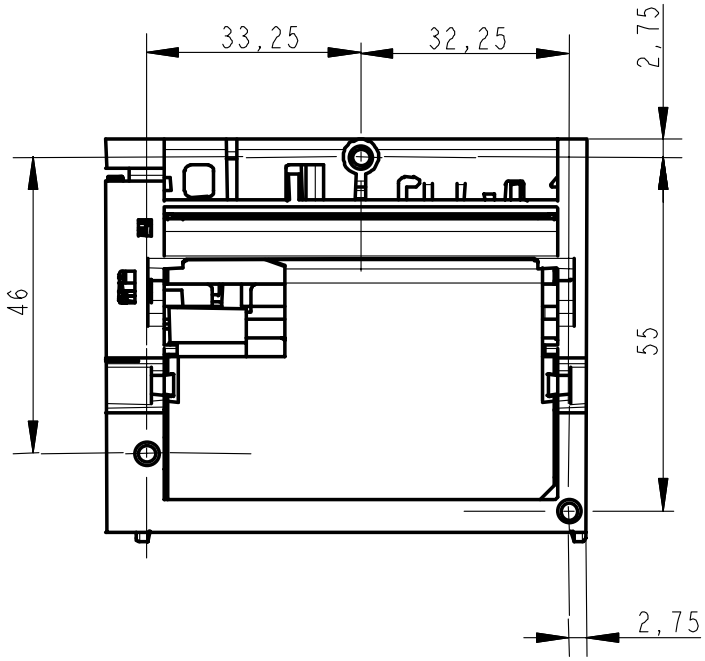



**Fig. 5 bottom view / fixing holes**




Use self-threader screws for plastic, the fixing holes diameter being 2.5 mm, use a maximum diameter of 3 mm for screws and a maximum depth in chassis of 7 mm (from the external edge of holes).

**Fig. 4 cutter top view**

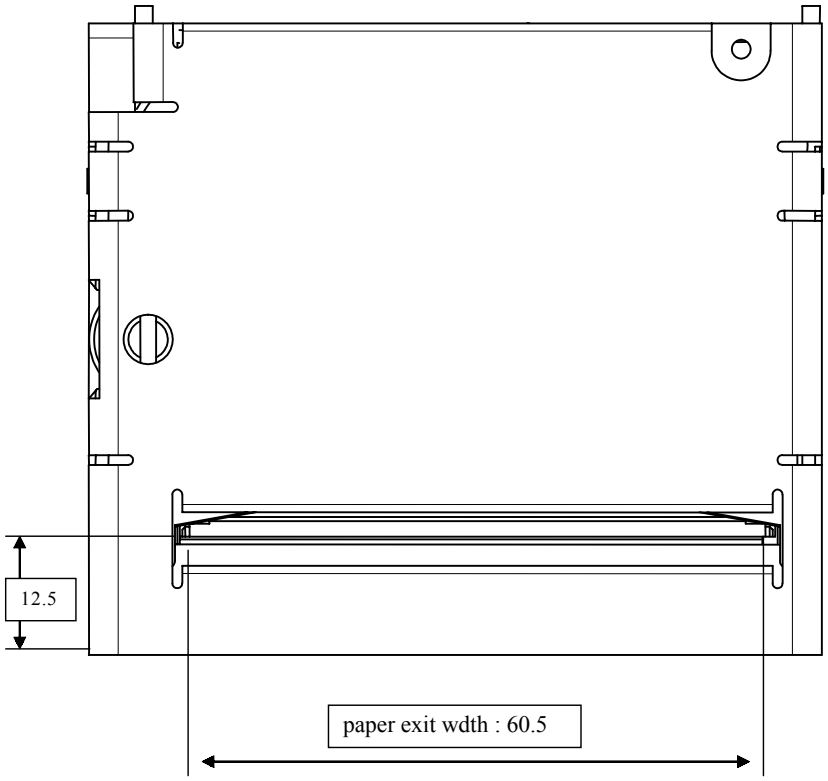
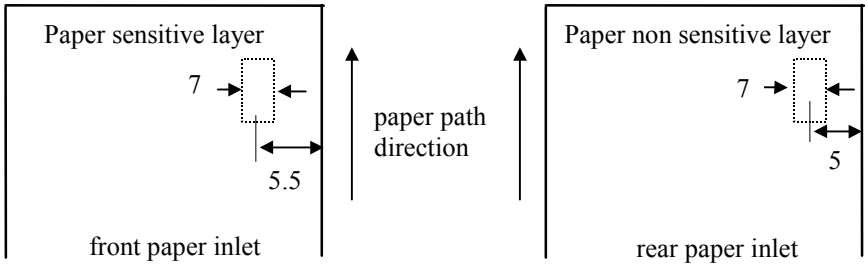



**Fig. 5 Opto- sensor position**

The position of the end of paper opto-sensor relatively to the paper allows top off form detection



# 4 ELECTRICAL SPECIFICATIONS

## *4.1 Nominal Power supply*

| | Value | Units |
|---|---|---|
| **Print head:**<br>**Logic (Vcc)**<br>**Dot line** | <br>**5**<br>**24** | <br>**V DC**<br>**V DC** |
| **Stepping motor** | **24** | **V DC** |

## *4.2 Nominal Consumption*

| | RMDG | Units |
|---|---|---|
| **Print head:**<br>**Heating**<br>**current / dot**<br>**(Vch) at nominal values** | **23** | **mA** |
| **Logic current / dot (Vcc)** | **100** | **µA** |
| **Stepping Motor (*2 activated phases*) for paper feed** | **320 unipolar**<br>**600 bipolar** | **mA** |
| **Stepping Motor (*2 activated phases*) for versions with cutter (RMxx)** | **1000 bipolar** | **mA** |
| **Maximum instantaneous current per dot line (*at* 24V)** | **8.8** | **A** |

## *4.3 Description of print head*

| | Value | UNIT |
|---|---|---|
| Driver chips<br>(64 bit BiCMos LSI) | 6 | - |
| Nominal dot resistance | 1000 (± 3 %) | ohms |
| Nominal dot energy<br>(*in standard conditions*) | 0.8 | mJ |
| Max printing speed (with 24V power supply)<br>(*with dot historical control*) | 8 | cm/sec |

### 4.3.1 Function of each 64 bit IC (integrated circuit)

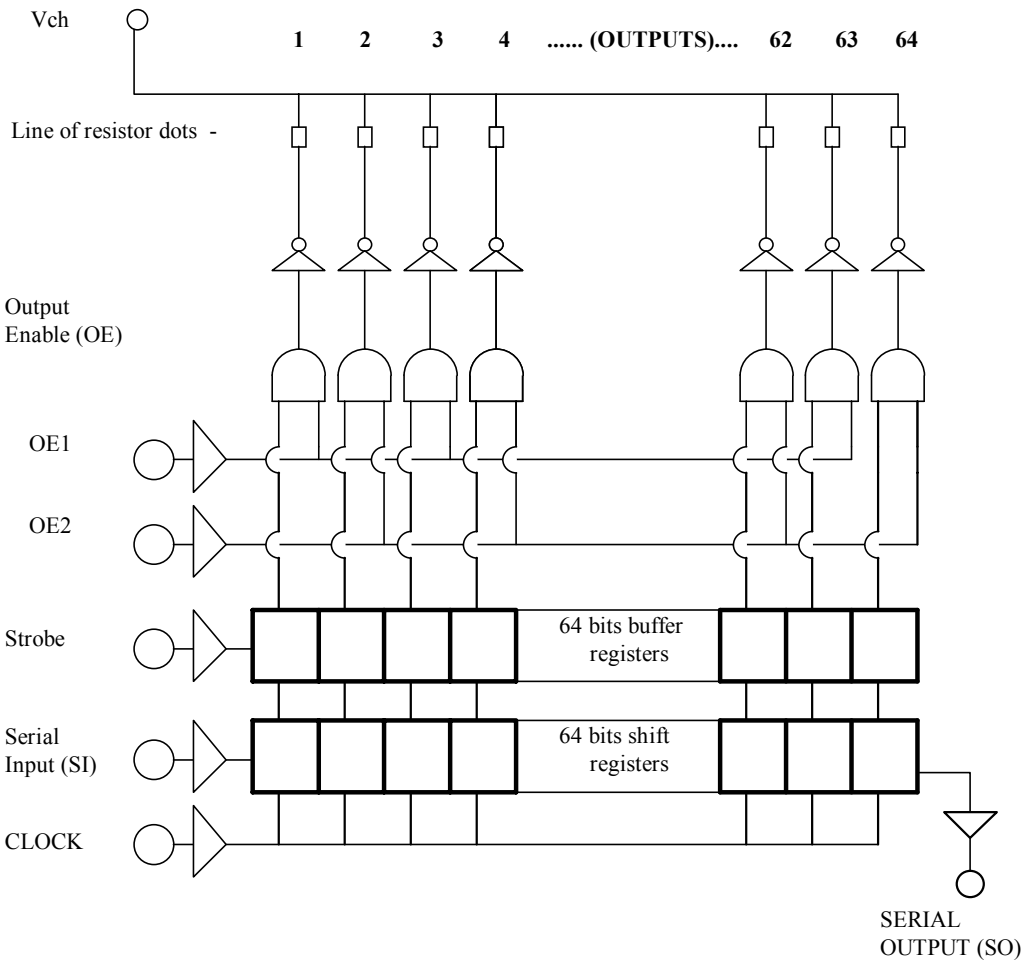



**Fig.6 Driver IC schematic**

| | |
|---|---|
| **These circuits are supplied by** | **5V +/- 5% logic voltage** |
| **Each circuit features** | **64 open collector transistors** |
| | **64-bit shift register** |
| | **64-bit memory register** |
| **Each circuit controls** | **64 resistor dots on the print head** |

The heating element power supply VCH is not connected to the Driver ICs but only to the resistive line of dots itself. The driver ICs are connected via a pattern of high current gold interconnecting traces to the line of resistor dots.

The dot line is of the interdigitated type, in order to maintain the tight definition of the dot geometry and resistance. In such a scheme the heating element power supply VCH forms a 'comb' of traces over which the resistive line of dots is laid. The outputs of the driver ICs form a second comb interdigitated with the first.

4.3.2 Operation of the complete module

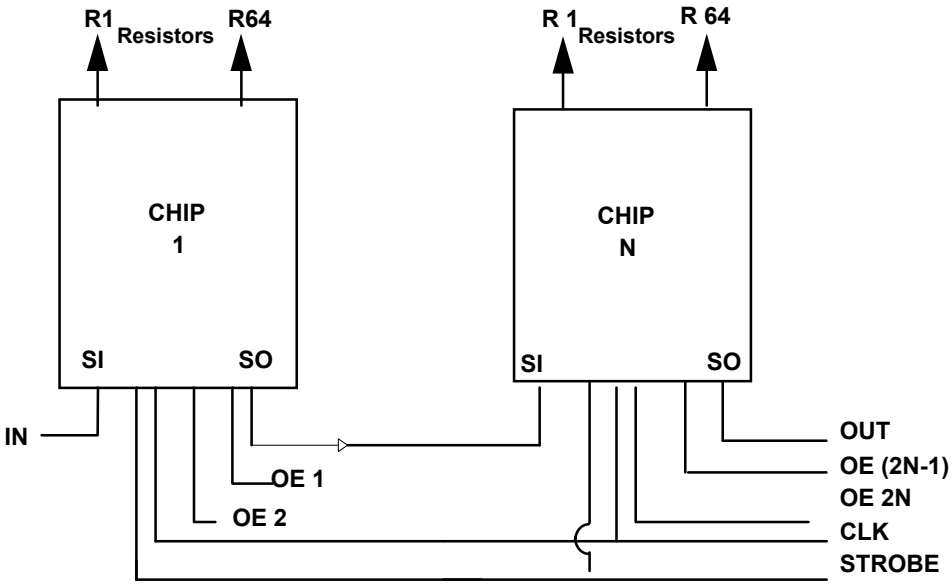



**Fig.7**

- Data to be printed is clocked into a shift register formed by cascading "n" chips.
- E.g. 384 dot head uses 6 chips with the SO output of chip 1 used as the SI input for chip 2 etc. Respectively, the SO output of chip 2 is used as the SI input for chip 3 etc.

After 384 clocks, the initial piece of data entered corresponds to the last (384$^{th}$) dot of the line (the R64 output of the 6$^{th}$ chip). The last bit of data entered will correspond to the first dot of the line (R1 of the first chip).

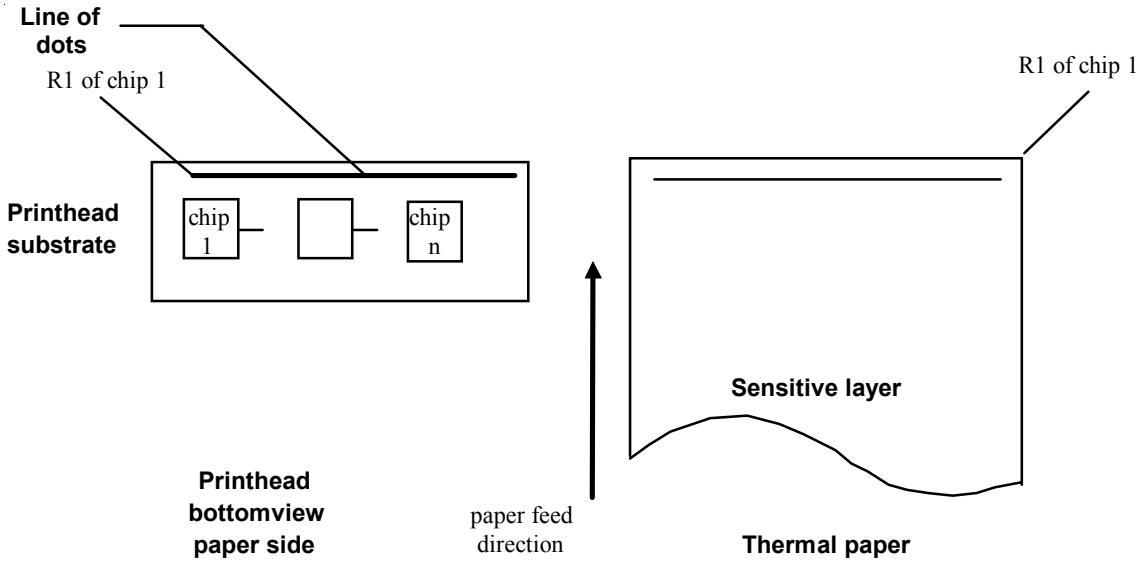



**Fig.8 Routing of data to the resistor dots**

### 4.3.3 Electrical specifications of 64-BIT LSI driver

#### *4.3.3.1 General*

| PARAMETER | MIN | MAX | UNIT |
|---|---|---|---|
| **Max. voltage at outputs 1 to 64 (Vdon)** | | **26.4** | **V** |
| **Max. input voltage** | | **Vdd** | **V** |
| **Max. output current/dot** | **-27.3** | | **mA** |
| **Total max. output current** | **-1.7** | | **A** |

#### *4.3.3.2 Other*

**The specifications given below are given for the following conditions:**

**- Room temperature**
**- Logic voltage on chip: 4.75 V < Vdd < 5.25 V**
**- Clock frequency: 4MHz**

| Logic Current (5 V) | Conditions | Values | Symb |
|---|---|---|---|
| **Current supply** | **All high** | **7 mA** | **Idd** |
| **Min. high-level input voltage** | **Vdd = 5V** | **0.7Vdd** | **Vih** |
| **Max. low-level input voltage** | **Vdd ≤ 5V** | **0.3 Vdd** | **Vil** |
| **Max. high-level input current** | | **0.5µA** | **Iih** |
| **Max. low-level input current** | | **0.5µA** | **Iil** |
| **Min. high-level output voltage** | **Vdd = 4.5** | **4.45 V** | **Voh** |
| **Max. low-level output voltage** | **Vdd = 4.5** | **0.05 V** | **Vol** |

| Heating current | Conditions | Values | Symb |
|---|---|---|---|
| **Max. power output current** | **Vdon=Vdonmax** | **27.3 mA** | **Idomax** |
| **Max. output leakage current** | **Vdon=24 V, All low** | **0.7 µA** | **Idoleak** |

*4.3.3.3 Timing*

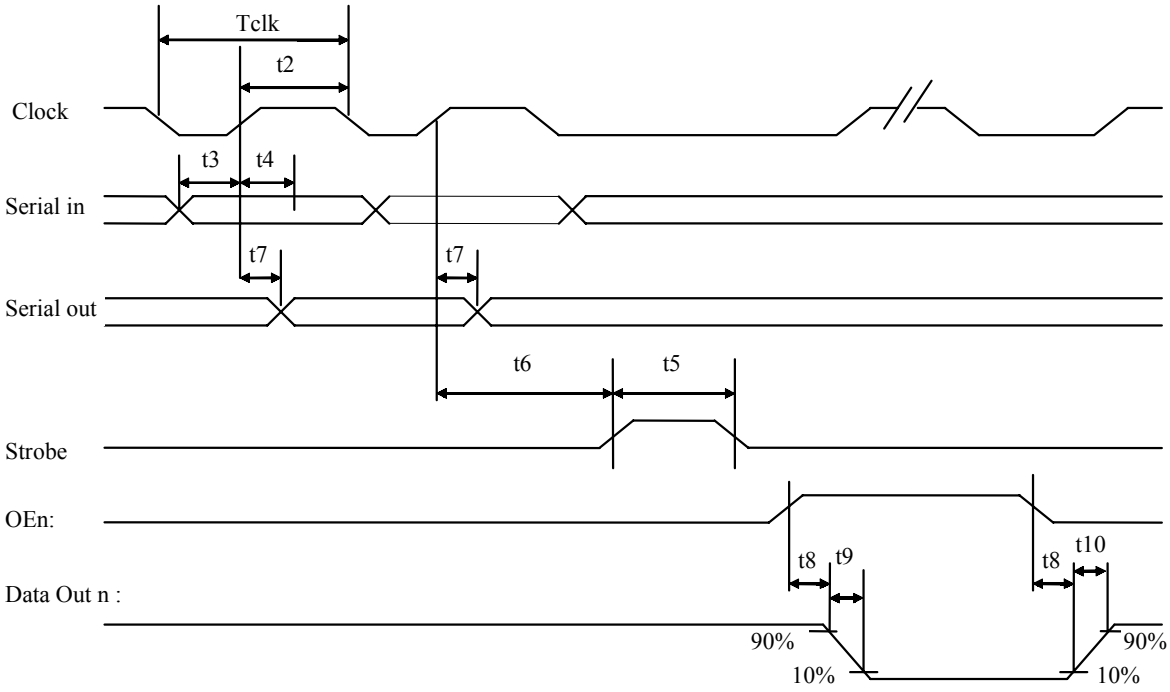


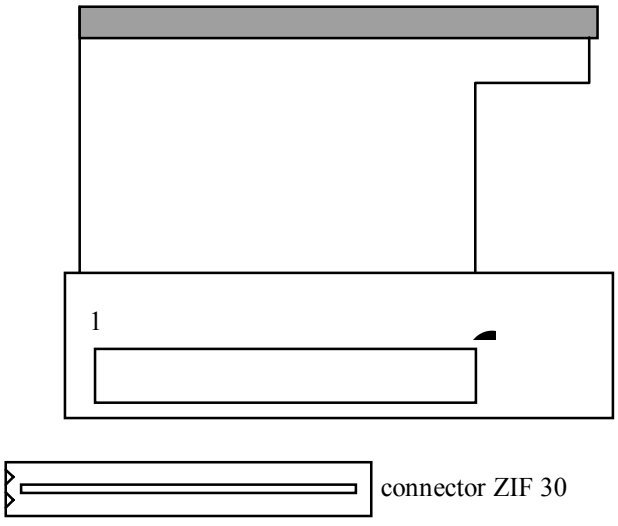

**Fig.10 Timing diagram for CM-RMDG**

| Sym | Description | Min | Max | Unit |
|---|---|---|---|---|
| **Tclk** | **Serial clock period** | **250** | | **ns** |
| **Tr, Tf** | **Rise, fall time f clock, 10% -> 90%** | **-** | **-** | **µs** |
| **Tdoec** | **Clock to OE delay time** | **-** | **-** | **µs** |
| **Tdcoe** | **OE to clock delay time** | **-** | **-** | **ns** |
| **Tsdc / t3** | **Data in to clock setup time** | **50** | | **ns** |
| **Thdc / t4** | **Data in from clock hold time** | **10** | | **ns** |
| **Tdcs0 / t7** | **Serial data out from clock delay** | | **120** | **ns** |
| **Tdcs1** | **Serial data out from clock delay** | **-** | **-** | **ns** |
| **Tscl / t6** | **Clock to strobe delay time** | **100** | | **ns** |
| **Tst / t5** | **Strobe high time** | **100** | | **ns** |
| **Tdos** | **Strobe to OE delay time** | **-** | **-** | **ns** |
| **Tdoedo / t8** | **OE to data out delay time** | | **2** | **µs** |
| **Tfdo / t9** | **Data out fall time, 10% -> 90%** | | **0.5** | **µs** |
| **Tddooe** | **OE to data out delay time** | | **-** | **µs** |
| **Trdo / t10** | **Data out rise time, 10% -> 90%** | | **2** | **µs** |

4.3.4 Print head Connection

**PINOUT OF ZIF 30 CONNECTOR**

| PIN N° | SIGNAL | PIN N° | SIGNAL |
|---|---|---|---|
| 1 | Vch | 16 | GND |
| 2 | Vch | 17 | GND |
| 3 | Cutter motor B2 | 18 | GND |
| 4 | Cutter motor B1 | 19 | GND |
| 5 | Cutter motor A1 | 20 | GND |
| 6 | Cutter motor A2 | 21 | Thermistor 1 |
| 7 | Switch Out | 22 | Thermistor 2 |
| 8 | Anode Opto-sensor | 23 | OE1 |
| 9 | Collector Opto-sensor | 24 | Data In |
| 10 | Data Out | 25 | Paper feed motor B2 |
| 11 | Clock | 26 | Paper feed motor B1 |
| 12 | Strobe | 27 | Paper feed motor A2 |
| 13 | OE3 | 28 | Paper feed motor A1 |
| 14 | Vcc | 29 | Vch |
| 15 | OE2 | 30 | Vch |



This connector (fitted on your printer) should be connected to your board with a 30 pins flex to another compatible connector.

Compatible connector suppliers and references:

| | |
|---|---|
| Molex 5597 3951 3304 | straight connector |
| Molex 5597 3951 3303 | bent connector |
| Stocko MZF 9390 60 3030 | straight connector |
| Stocko MZF 8900 60 3030 | bent connector |

Chip connection for 8 dots/mm print-head (6 chips to connect)

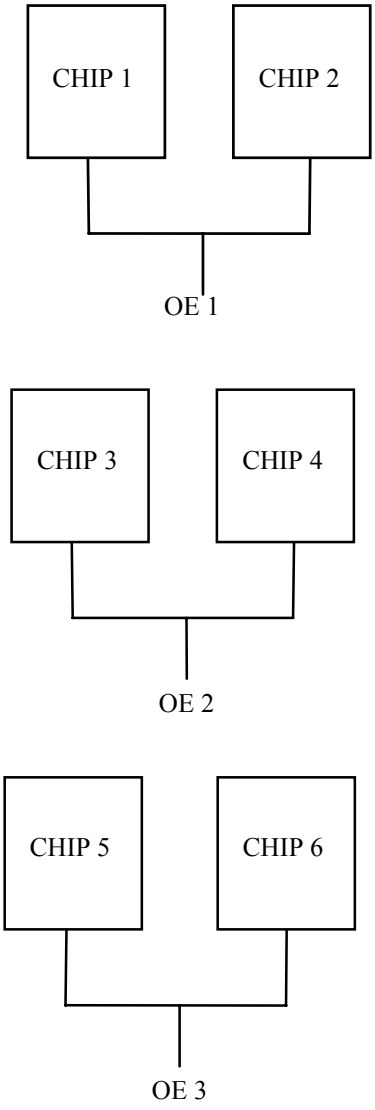



**Fig. 12**

## *4.4 Unipolar paper feed motor*

### 4.4.1 General specification

- Operating range: 20V < V < 28V (24V nominal)
- Coil resistance: 150 Ω ± 10%
- Number of phases: 4
- Drive method: 2 phases on
- Current drawn: 160 mA per phase
- Maximum starting frequency: 500 pps
- Steps to initialize paper feed: 4
- Step angle: 7° 30‘
- Number of steps per revolution: 48

Acceleration table: this motor takes 20 steps to reach its maximum speed (1600 µs which means 600 pps and 75 mm/s). In this table the first row shows the motor pitch and the second one shows the motor phase time in µs.

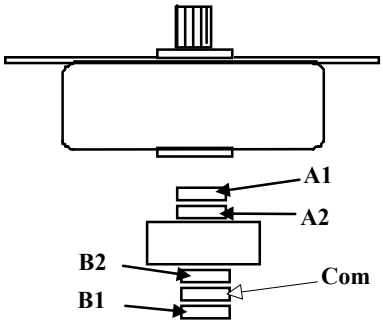
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| 2000 | 1997 | 1990 | 1981 | 1967 | 1950 | 1930 | 1908 | 1883 | 1858 |

| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|
| 1832 | 1806 | 1781 | 1757 | 1734 | 1715 | 1698 | 1683 | 1674 | 1667 |

### 4.4.2 Connection

Connection to the PCB

| PIN n° | Wire color | Motor |
|---|---|---|
| 1 | black | A1 |
| 2 | brown | A2 |
| 3 | yellow | B2 |
| 4 | orange | B1 |
| 5 | empty | |
| 6 | red | COM |




The PCB is then connected to the flexible containing all supply and control, see page 16.

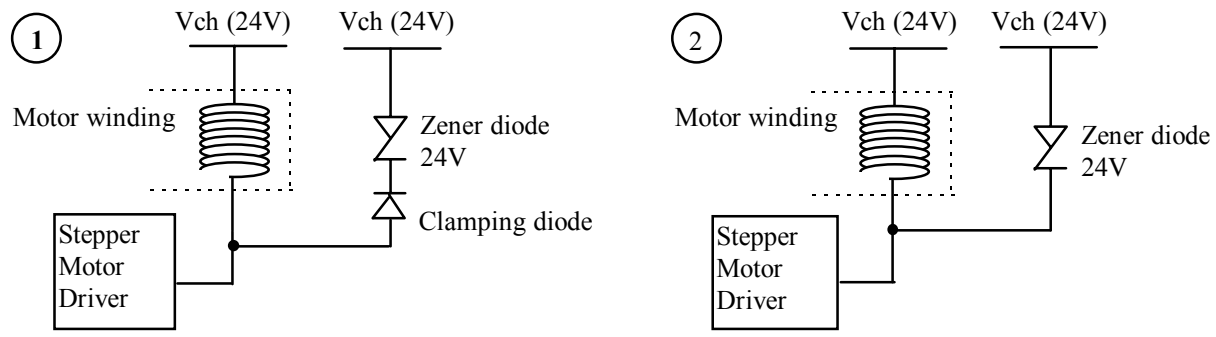
4.4.3 Induction sequence

| | BLACK | BROWN | ORANGE | YELLOW | RED<br>RED |
|---|---|---|---|---|---|
| **Step 1** | - | | | - | + |
| **Step 2** | - | | - | | |
| **Step 3** | | - | - | | |
| **Step 4** | | - | | - | |
| **Voltage on cable is negative where shown as "–"<br>Otherwise cable is floating except if shown as " "** | | | | | |

External circuit

*Examples*:

1 when clamping diode is not integrated to the stepper motor driver
2 when clamping diode is integrated to the stepper motor driver




***Note*:** If the phase currents are switched to zero, the position in the sequence must be memorized. When the winding currents are re-applied the polarities corresponding to the last known position should be used. This ensures that the motor will re-start correctly (this is also true for the next chapter *(bipolar motor)*).

## *4.5 Bipolar paper feed motor*

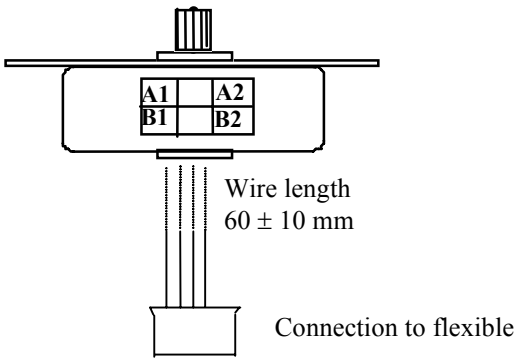
An optional bipolar motor is available for paper feed

### 4.5.1 General specification

- Recommended control voltage: 24V
- Coil resistance: 20 Ω ± 10%
- Number of phases: 4
- Step angle: 7° 30'
- Paper feed for one printing line: 1 (CMDG)
- Recommended control current: 300 mA (peak)
- Maximum starting frequency: 500 pps

### 4.5.2 Connections

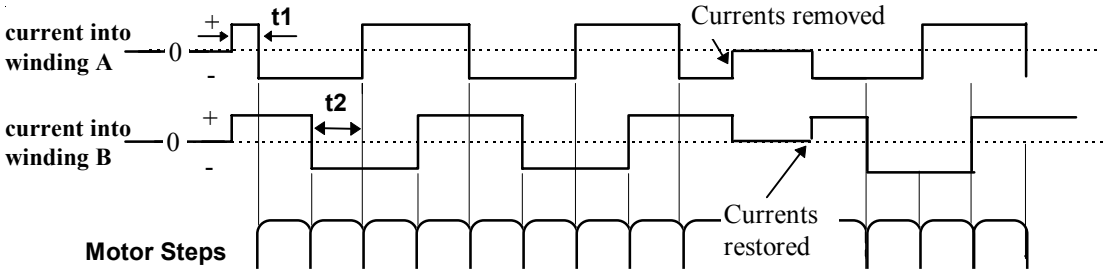
| PIN n° | Wire color | Motor |
|---|---|---|
| 1 | black | A1 |
| 2 | brown | A2 |
| 3 | yellow | B1 |
| 4 | orange | B2 |
| 5 | empty | |
| 6 | empty | |



4.5.3 Induction sequence and timing

| | BLACK | YELLOW | BROWN | ORANGE |
|---|---|---|---|---|
| STEP 1 | — | — | + | + |
| STEP 2 | + | — | — | + |
| STEP 3 | + | + | — | — |
| STEP 4 | — | + | + | — |

**Voltage on cable is negative where shown as "-".**
**Voltage on cable is positive where shown as "+".**




There are 4 different conditions for the motor windings:

**The sequence is:**

$$AB \Rightarrow \bar{A}B \Rightarrow \overline{AB} \Rightarrow A\bar{B} \Rightarrow AB$$

Where

$A\bar{B}$ **stands for "A is positive and B is negative" etc.**

- This electrical sequence corresponds to a sequence of 4 consecutive mechanical positions. The sequence is repeated 12 times for each revolution.

**- t1 = 0.4 ms**
**- t2 = 2 ms**

**Motor initialization**

Once the initial winding currents have been applied they must be maintained for a time t1. Once this time has passed the motor may be operated by changing the winding currents in the usual way.

The same acceleration table can be used for bipolar motor than for unipolar motor (see page 18)

To take-up the play in the gears it is necessary to operate the motor for 16 steps before starting to print.

4.5.4 Bipolar stepping motor electric control

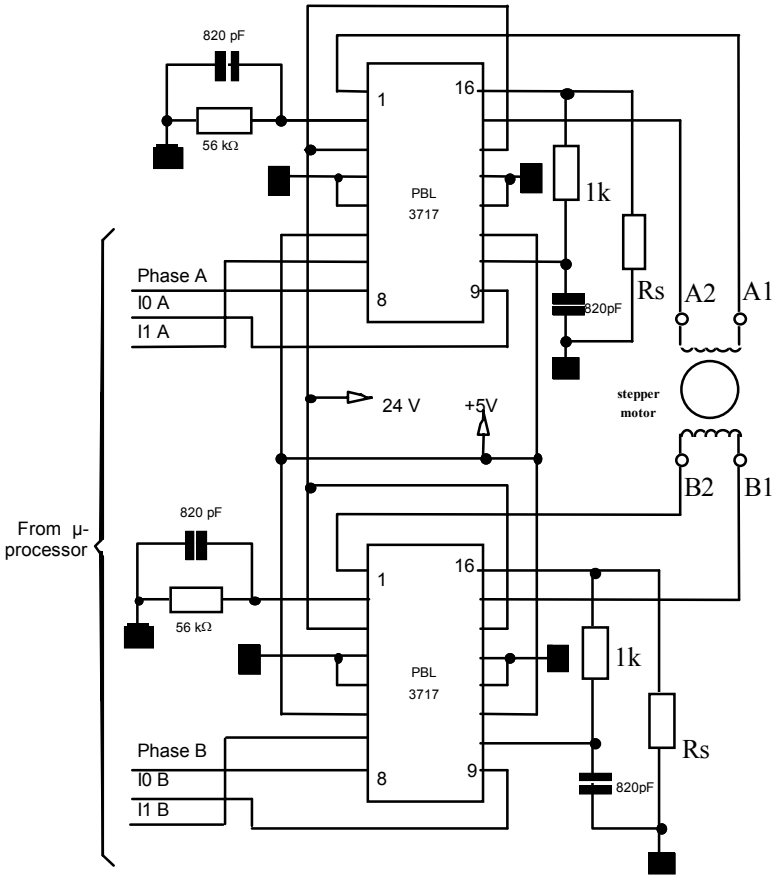



**Fig.13 Example**

***Note 1***: Rs: resistors of 0.8 ohm
with I0A and I0B = 1 and
I1A and I1B = 0 --->I = 0,3 A (*the required control current for paper feed*).
with I0A and I0B = 0 and
I1A and I1B = 0 --->I = 0,5 A (*the required control current for cutter*).

***Note 2***: to obtain 0.8 Ω (which is not standard) it is possible to set 1Ω and 4.75Ω in parallel.

For other stepping motor control requirements, please contact us.

## *4.6 Bipolar cutter motor*

### 4.6.1 Overview

The cutter is mounted to the printer cover and includes parts below:

- Stepping motor
- Cutter drive wheel & rack
- Switch

This cutter can achieve partial or total cuts

### 4.6.2 General specification

- Coil resistance: 8 Ω
- Step angle: 15°
- Number of steps per revolution: 24

### 4.6.3 Connection

Connected to the PCB

### 4.6.4 Induction sequence

| | A1 | A2 | B1 | B2 |
|---|---|---|---|---|
| Step 1 | - | + | - | + |
| Step 2 | - | + | + | - |
| Step 3 | + | - | + | - |
| Step 4 | + | - | - | + |

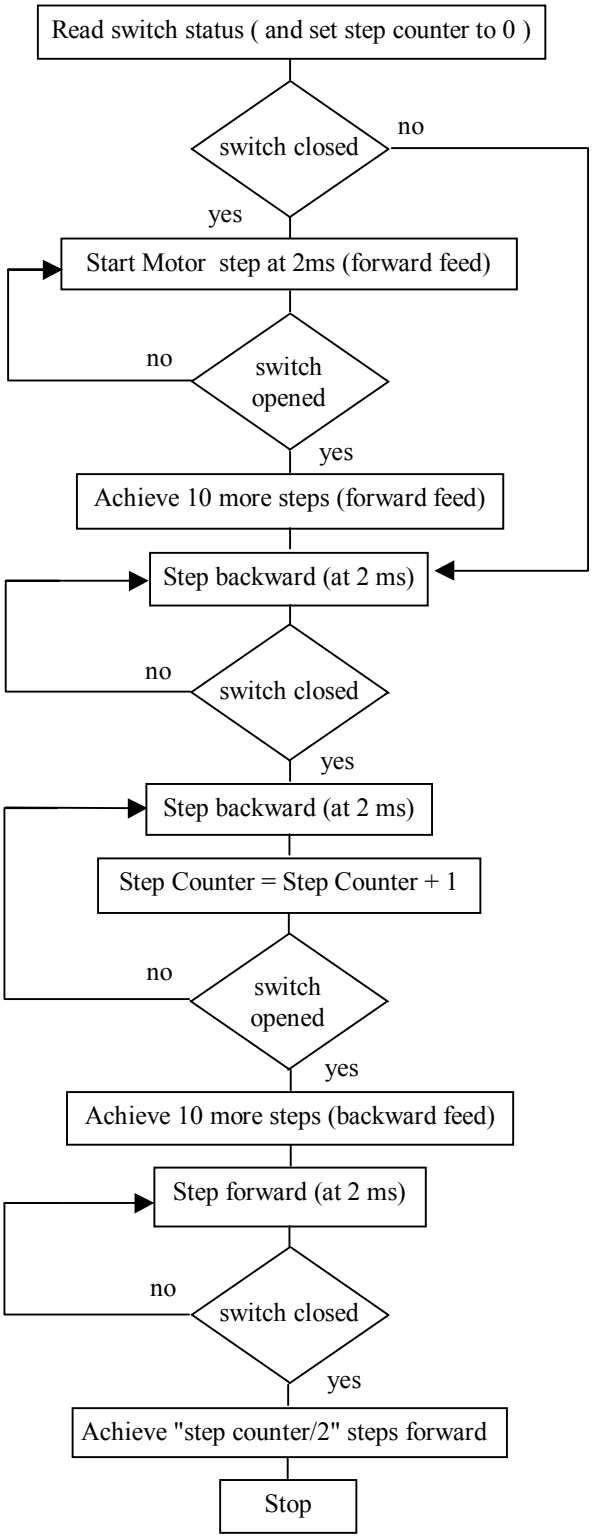
### 4.6.5 Cutter Initialization

The sequence described next page with logic chart allows the cutter to be well positioned when the system (mechanism & controller board) is powered on (or reset).

***Notes***:

- The logic chart is designed to place the cutter in the middle of the "closed switch area".
- When ten additional steps in are achieved after a switch status reading, this avoids reading mistake due to switch bounce.

Cutter initialization logic chart:



### 4.6.6 Cutter Motor Acceleration Ramp-Up

The cutter can be started with a motor step time of 2 ms, and then the speed can be increased by reducing this cycle time up to 1 ms following the curve given here after.

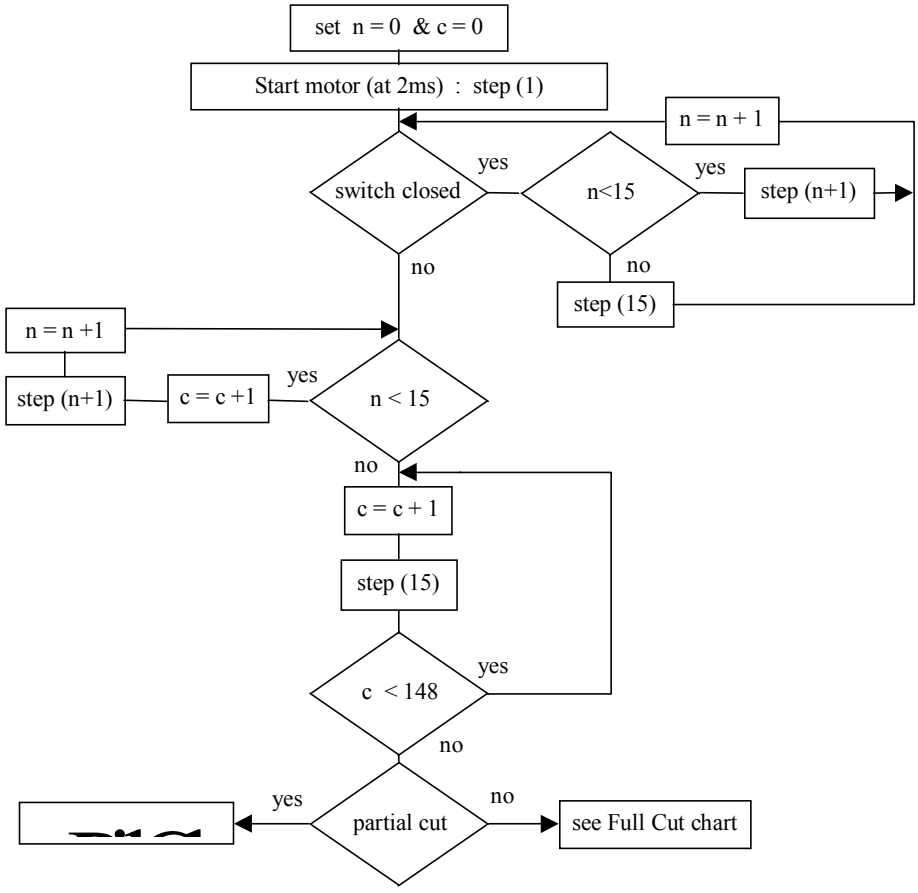
| Step | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Time (µs) | 2000 | 2000 | 2000 | 2000 | 2000 | 1800 | 1660 | 1530 |

| Step | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|
| Time (µs) | 1420 | 1330 | 1250 | 1170 | 1110 | 1050 | 1000 |

***Notes***:
- This curve uses 2000µs on the first 5 steps, this does not correspond to acceleration but to a routine applied in the next logic chart (where "step (n)" means one motor step is achieved with the step time given above).
- This acceleration ramp up can be used either for forward or backward blade movement.

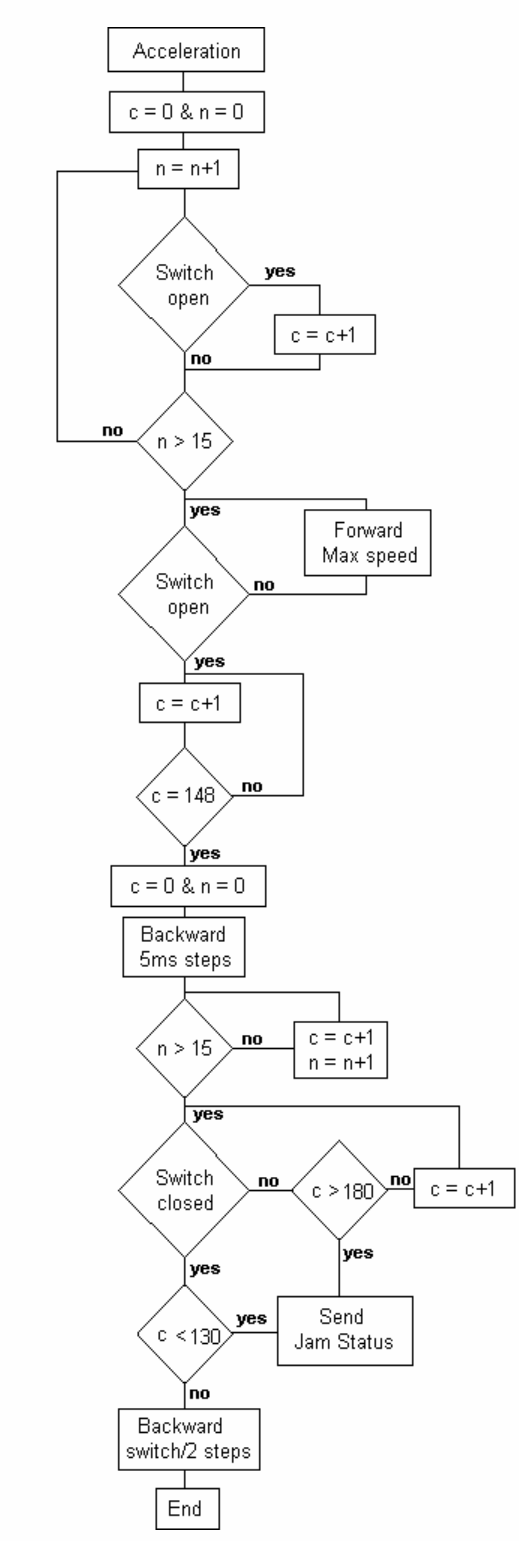
### 4.6.7 Cutter Driving Chart

This first chart allows starting the cutter with the acceleration ramp up previously given (for motor step time).

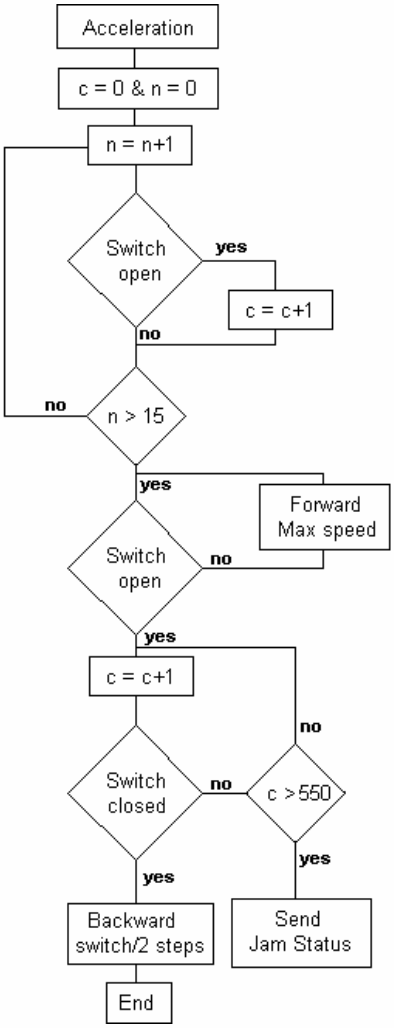


The chart changes now here depending on the type of cut required: partial or full cut.

**PARTIAL CUT**




**FULL CUT**




**n** is the number of steps for the cutter motor acceleration.

**c** is the number of steps for the total cycle of partial or full cut.

## *4.7 Cutter micro-switch specifications*

### 4.7.1 General specification

| | |
|---|---|
| **Reference** | **DB3A-A1BA Switch Cherry** |
| **Contact resistance** | **50 mΩ Maximum** |
| **Maximum Current** | **0,1A - 125 V AC (UL V0)** |
| **Maximum Rating** | **2 000 000 Open-Close cycles** |

### 4.7.2 Connection

**Connected to the PCB with cutter motor and integrated to the flexible**

| Wires | Contact Status | 'Guillotine' blade |
|---|---|---|
| **White / White** | **Open** | **Closed** |
| | **Closed** | **Open** |

## *4.8 Opto-sensor specification*

### 4.8.1 Electrical characteristics

**Absolute Maximum ratings**

| | SYMBOL | RATING | UNIT |
|---|---|---|---|
| **LED** | | | |
| **Continuous Forward Current** | **If** | **50** | **mA** |
| **Pulsed forward current *** | **IFP** | **1** | **A** |
| **Reverse voltage** | **VR** | **5** | **V** |
| **Max. Power Dissipation at 25°C max** | **P** | **75** | **mW** |
| **PHOTO-TRANSISTOR** | | | |
| **Collector Emitter Voltage** | **VCEO** | **30** | **V** |
| **Collector Current** | **IC** | **20** | **mA** |
| **Collector Dissipation at 25°C max** | **PC** | **50** | **Mw** |

*** (Time On, Time Off) T On = 100µs, T On + T Off = 10 ms**

***Note*:** Driving the sensor with pulse current allows using higher current to improve paper detection.

**Input/Output Conditions**

| | SYMBOL | CONDITIONS | Min. | TYP. | Max. | UNIT |
|---|---|---|---|---|---|---|
| **LED** | | | | | | |
| Forward voltage | **VF** | **IF=10 mA** | | | **1.3** | **V** |
| Reverse current | **IR** | **VR=5v** | | | **10** | **µA** |
| **TRANSFER CHARAC.** | | | | | | |
| Collector dark current | **ICE0** | **VCE=10V** | | | **200** | **nA** |
| Light Current | **IL** | **VCE= 5V, IF=10mA** | **90** | | | **µA** |
| Leakage Current | **ICE0D** | **VCE= 5V, IF=10mA** | | | **200** | **nA** |
| Rise time | **tr** | **VCE= 2V, IC=100µA** | | **30** | | **µs** |
| Fall time | **tf** | **RL= 1kΩ** | | **25** | | **µs** |
| Peak wave length | **λp** | | | **940** | | **nm** |

## 4.8.2 Connection

Connected to the PCB, the opto-sensor is then clipped in front or bottom position.

## 4.8.3 External circuit

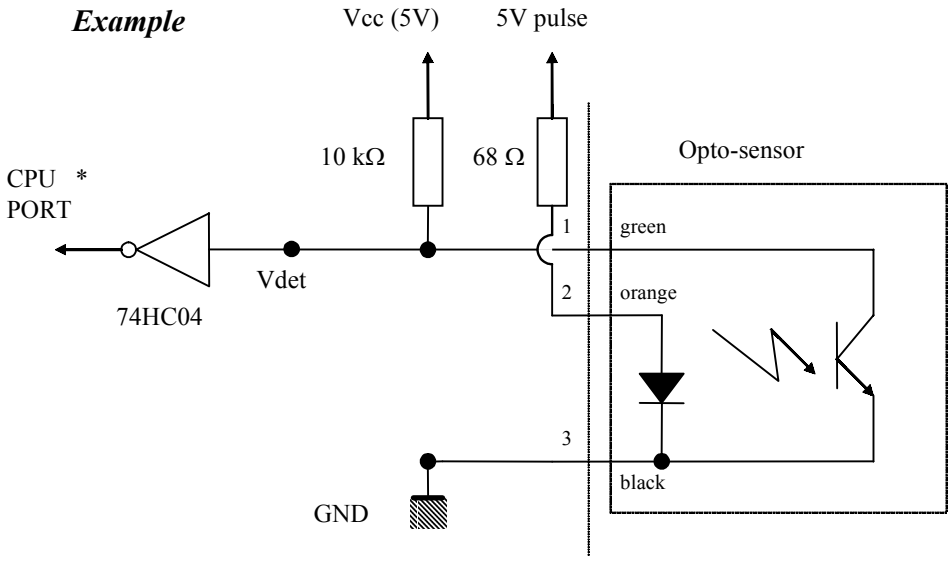



**Fig. 14**

***Note*: When paper is detected Vdet < 2.25V.**

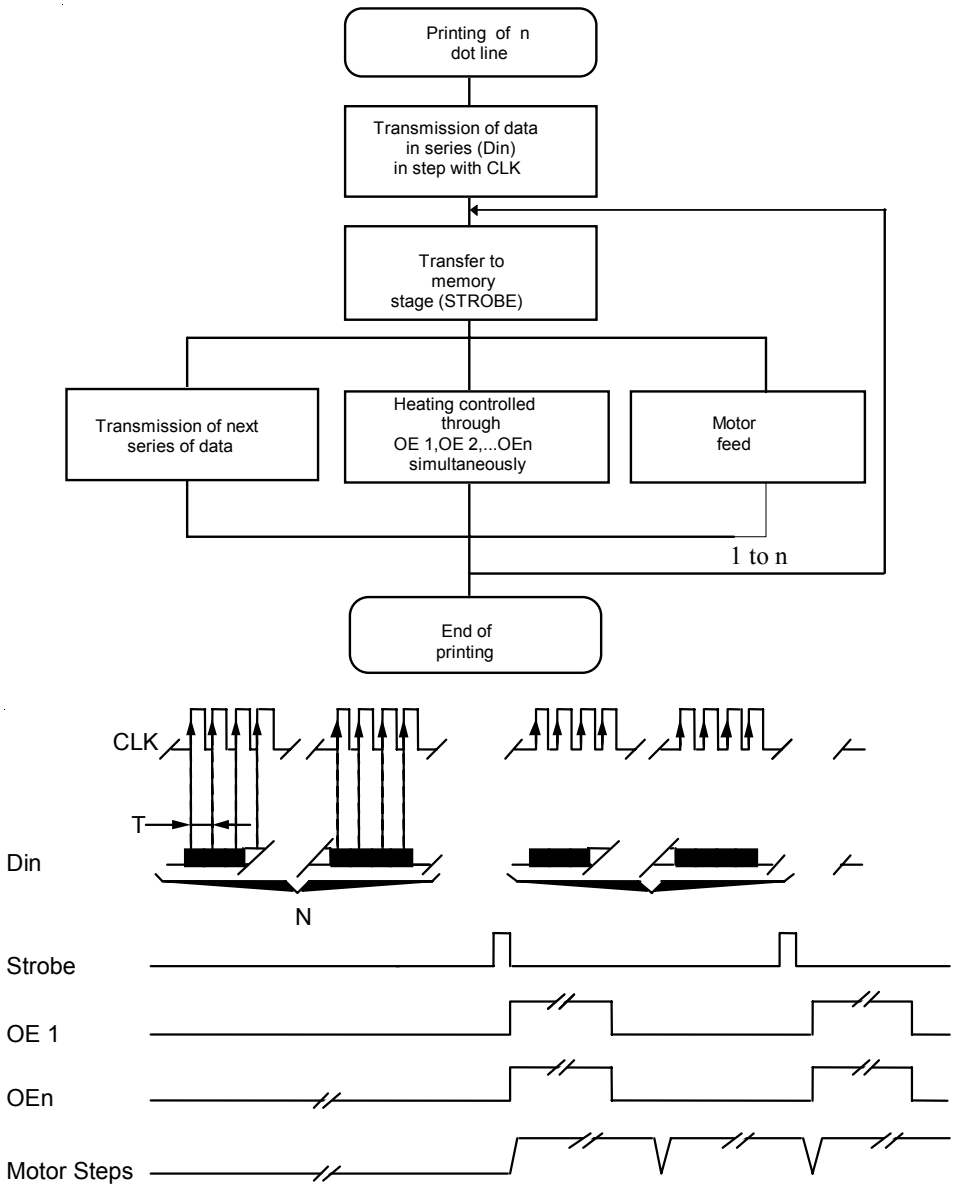
* The rise time and fall time depend on the voltage and current driving conditions. In the example above we recommend to measure the sensor response 300 µs after the current leading edge of the pulse (or current establishment) in the sensor LED.

# 5 PRINTER CONTROL TECHNIQUES

For printer control techniques in order to operate the printer, We depict hereafter three possible modes.

## *5.1 Mode 1*

The paper feeds itself automatically during the heating cycle thereby permitting a high speed to be achieved. (in this mode, it is recommended to use historical control, see page 35)

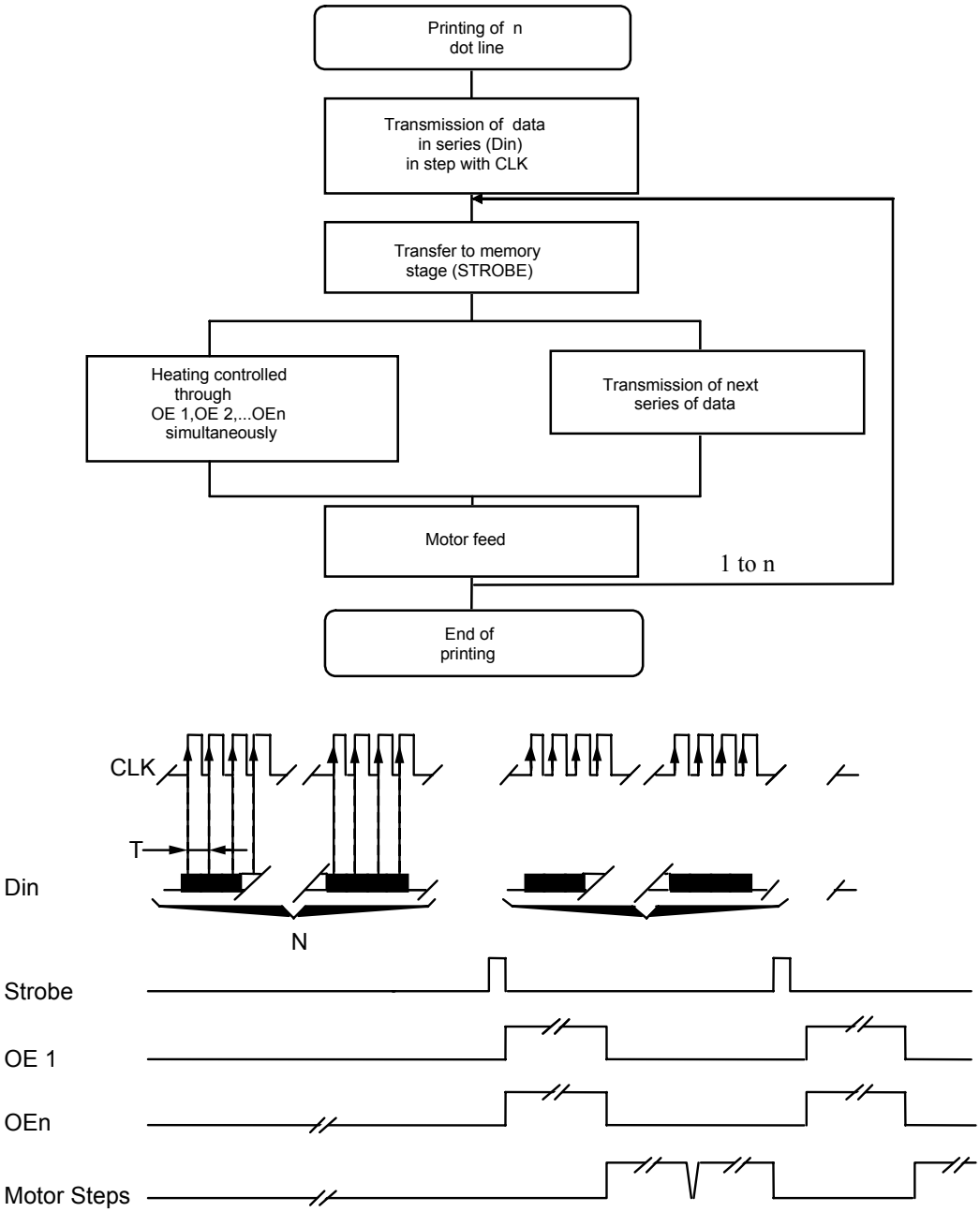



T : 4MHz for CM-RMDG

**Fig. 15 Timing diagram for mode 1**

## *5.2 Mode 2*

The paper feed occurs after the heating cycle giving high quality printing.

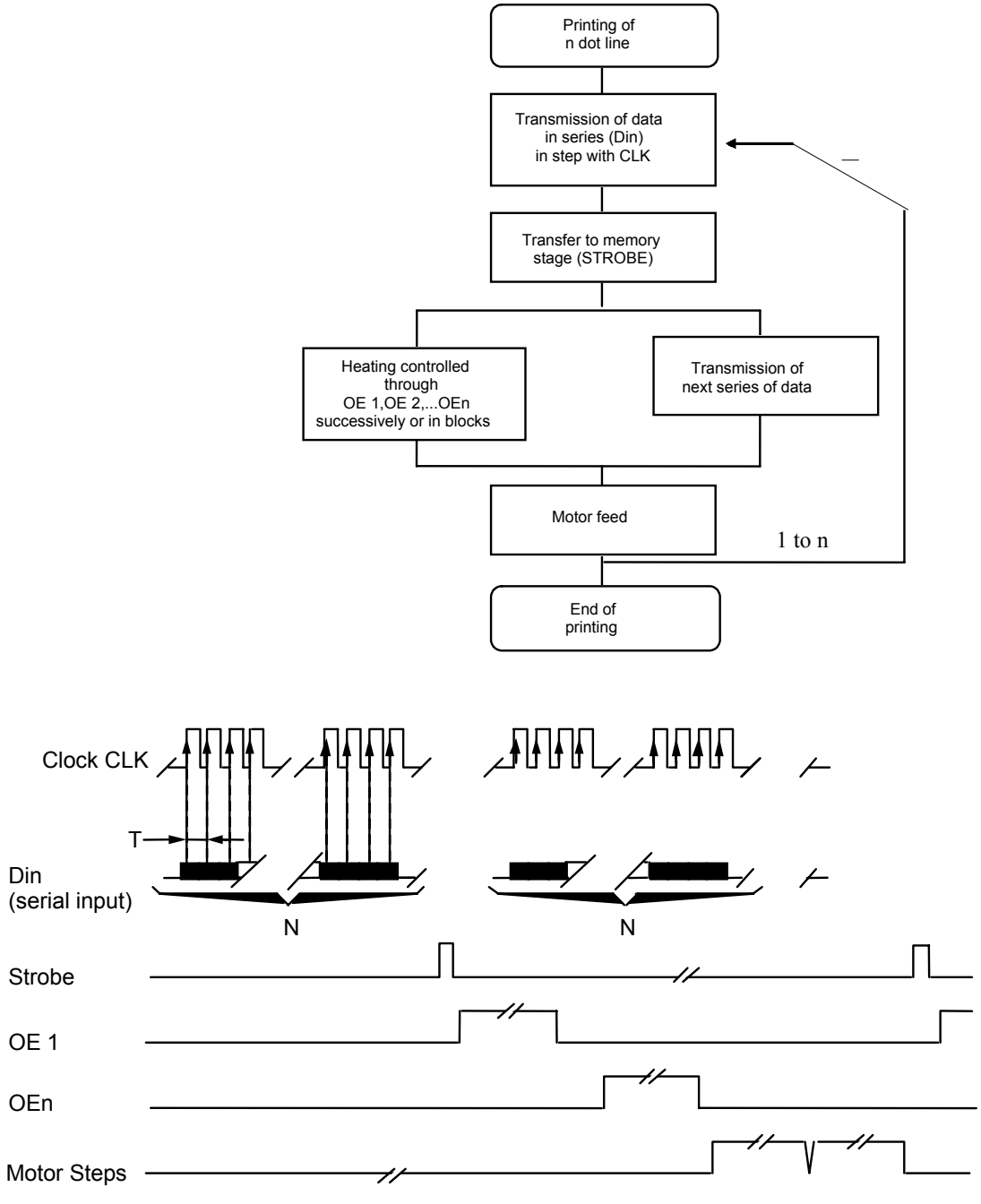



T : 4MHz for CM-RMDG

**Fig. 16 Timing diagram for mode 2**

## *5.3 Mode 3*

This mode is used in conditions where there is a limit of electrical current. The dot line is printed in stages heating only a portion of the line at a time, effectively giving reduced consumption.




T : Clock frequency 4MHz for CM-RMDG

**Fig. 17 Timing diagram for mode 3**

# 6 RECOMMENDATIONS

## *6.1 Mechanical recommendations*

Never apply mechanical stress to the printer; this could result in misalignment and thus degradation of the print quality.

The thermal print head must have 1 degree of freedom. Never hinder the print head from pivoting on its axis.

## *6.2 Housing design recommendations*

Forecast space for paper guide to use one of the two possible paper inlets (or both)

When the front paper inlet is used, we recommend an additional paper guiding to facilitate correct paper introduction.

See the fixation position, make sure it is easy enough to release printer, this operation is necessary for easy maintenance (change of print head for example)

Space to open cover: the cover (which contains the cutter) is strongly clipped, it is necessary to leave enough place to catch it in order to open it.

## *6.3 Energizing & de-energizing printer*

When energizing the thermal print head (Vcc, 5 V) it is important to apply all the logic signals within 10 ms (particularly to de-energize all the OEs).

If the line of dots (Vch, 24 V) is supplied before the control logic, resistor dots may be destroyed. Because the control logic has a random state, resistors might be heated for a longer period than the specified maximum, burning out the heated resistor.

To avoid this, we recommend applying the heating voltage (Vch) after the logic supply voltage (Vcc, 5V).

The same precaution should be taken when shutting down. The supply voltage Vch must be switched off before the logic supply voltage Vcc. Care should be taken to allow enough time for residual capacitive charge to dissipate.

## *6.4 Printing recommendations*

- In order to avoid excessive noise from the stepper motor, avoid using it at the following frequencies: between 150 and 250 pps (for better printing quality, avoid fast speed variations).
- To avoid the paper feed motor temperature rise, use a time ratio of 2 "on" 3 "off" up to 2 minutes maximum of continuous printing.

***Examples***: 2 seconds "On" followed by 3 seconds "Off", 20 seconds "On" followed by 30 seconds "Off".

## 6.5 Recommendations for paper

- As paper roll bearing, use an AXIOHM reference (or approved by).
- Use a paper roll of maximum diameter 80 mm when paper slides on its bucket, this value can be overshot up to 120 mm when paper roll is mounted on a friction-less axis (the maximum diameter also depends on the acceleration ramp up because of inertia).
- Leave the paper stock spool free to turn.
- The printer should not operate without paper as this will damage the surface of the platen.
- Paper with bad factor may affect the print head life.

## 6.6 General

- Ensure that there is adequate air circulation around the print head support/heat sink as poor ventilation of the print head can degrade the print quality.
- Never open the cover whilst the cutter is operating.
- Never introduce tools inside the printer, wires could be de-soldered or short circuited.
- It is very important that the print head support/heat sink is connected to the customer appliance chassis (see p16 pin out connection GND).
- Ensure that the cutter blades are in the correct position before use in order to ensure that they do not deteriorate.
- when continuous printing is performed, the supply energy should be reduced so that the head temperature monitored through the thermistor will remain below the maximum temperature.
- When setting 'power on / power off', strobe (STR) shall be on 'disable'.
- Heat elements and IC's shall be anti-electrostatic in order to prevent electrostatic destruction. Do not touch the connector pins with fingers.
- Make sure no foreign particles roll on the head surface, this would cause damage.
- If condensation occurs, do not switch on the printer until it has disappeared.

## 6.7 Cleaning recommendations

The CM/RMDG mechanisms are high reliable units which require very little maintenance but may benefit from cleaning as detailed below.
Depending on the environment in which the printer is used, the printer can accumulate dust. Therefore it is necessary to clean it periodically in order to maintain a good print quality. The cleaning period is dependant on the environment and the usage of the printer, but the print head should be cleaned at least once a year or up to one month in heavy duty applications. The print head should always be cleaned immediately if the print becomes visibly fainter due to its contamination.

**Cleaning Instructions:**
- Switch off printer. **Never clean the head immediately after printing, the head may be hot**.
- Open the printer cover and remove the paper from its slot.
- Clean the heating dots of the head with a cotton swab containing a solvent alcohol (ethanol, methanol, or IPA) but **do not touch the print head with your fingers!**
- Allow the solvent to dry.
- Reload the paper and close cover.

N.B**:** AXIOHM is able to provide cleaning kits **Ref: CK60000A**

## *6.8 Special recommendation for cutter*

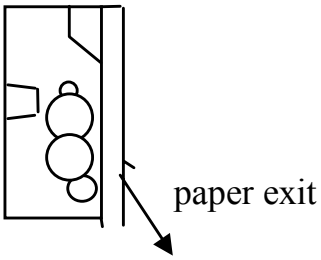
**Mechanical stress** should not be applied to the cutter cover; it would lead to a blade movement perturbation.

**Make sure the ground is connected.** Ground must stay connected while operating and manipulating the cutter cover.

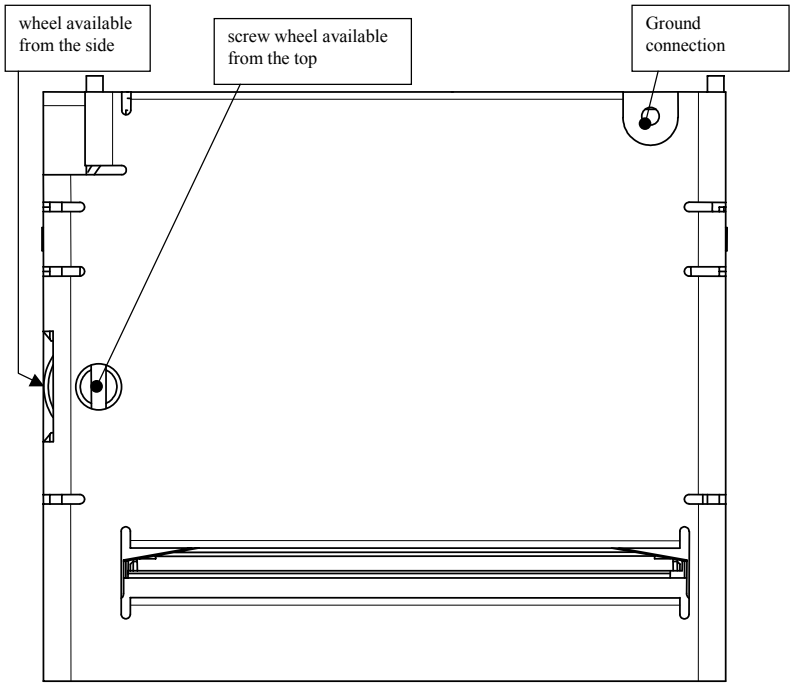
**Do not keep the cutter motor phase "on"** while the cutter is not operating (this would also lead to an increasing motor temperature).

**To avoid paper jam**, it is recommended to feed 2 mm of paper (16 motor steps) after cutting.

**A vertical position,** as shown on next drawing, is better for paper dust elimination.




**To release blades in case of jam,** use the wheel shown on next drawing:



# 7 APPENDICES

## *7.1 APPENDIX 1: Thermistor specifications*

| GENERAL CHARACTERISTICS | |
|---|---|
| **Maximum operating temperatures** | **-20° C to + 80° C** |
| **Rated resistance at 25° C** | **Rn (see table of values)** |
| **Tolerance for Rn** | **5 %** |
| **Thermal dissipation factor** | **_ = 5 mW/°C** |
| **Thermistor time constant/dot line** | **t = 30 sec** |
| **Resistance value as a function of temperature (see curves)** | |

**This thermistor has a rated value of 100 kΩ. Its resistance variation can be expressed as follows:**

$$R = Rn \exp B \left(\frac{1}{T} - \frac{1}{Tn}\right)$$ **where T is in Kelvin degrees (°K)**

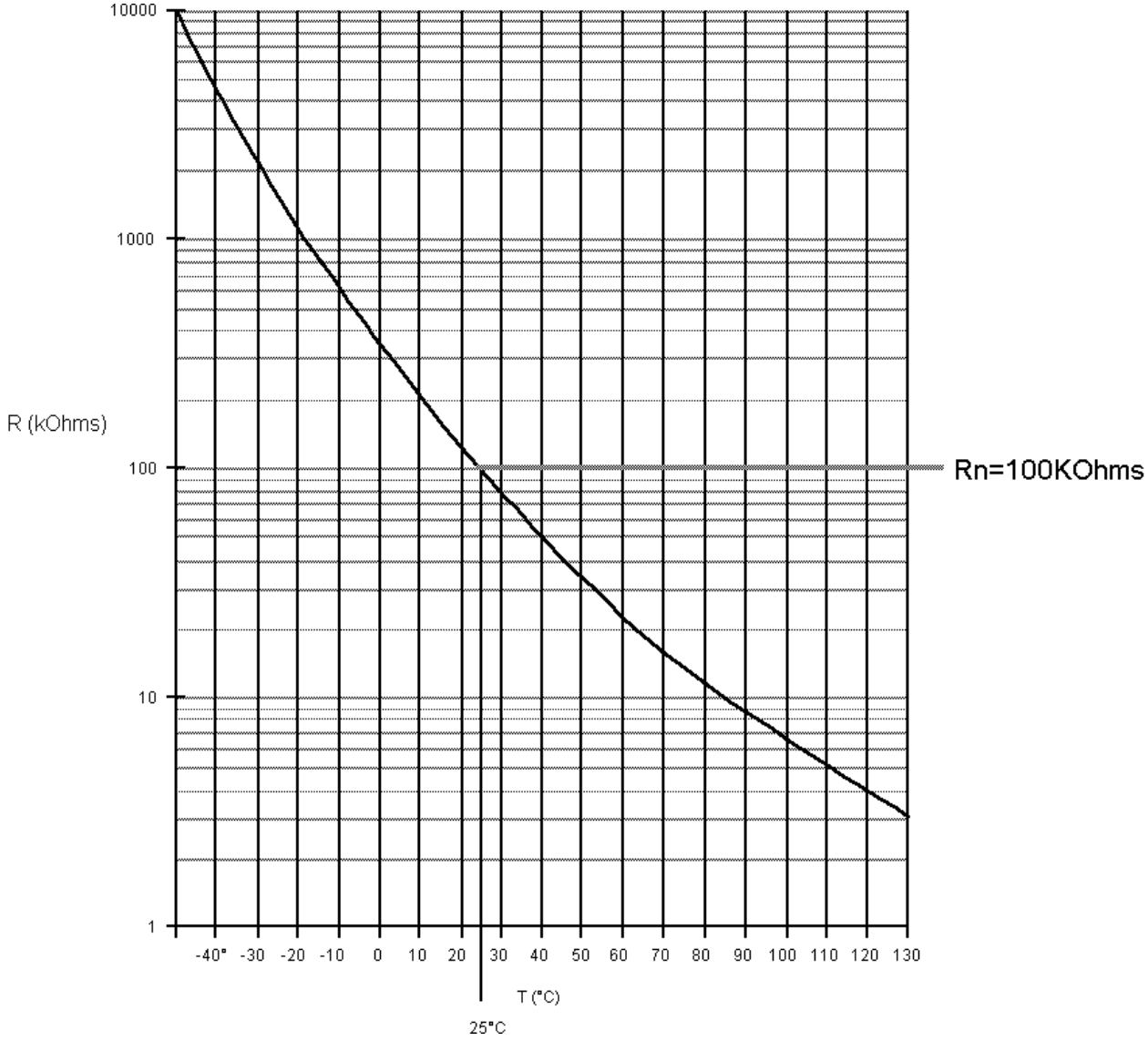
**4066° K**

**Rn = reference value at temperature Tn (295° K)**

**The main specifications of the thermistor are listed in the following pages.**

**NTC thermistor, rectangular size (IEC 12.05), silver palladium metallic coating.**

**RESISTANCE/TEMPERATURE VARIATION for CM-RMxx**



## *7.2 APPENDIX 2: Paper specifications*

Paper KP 440 (ref 2320061 in AXIOHM classification for 5 cm diameter roll)

| Property | Method | Unit | Value |
|---|---|---|---|
| Grams | ISO 536 | g/m2 | 58 +/- 5 |
| Thickness | ISO 534 | µm | 60 +/- 4 |
| Surface smoothness | ISO 5627 (Beck) | sec | 250 min |
| Brightness | BNL2 | % | 75 min |
| Whiteness | Macbeth RD 914 | OD | 0.09 min |
| Tensile strength | ISO 1924/1 | KN/m | > 3.3 MD |
| | | | > 2 CD |
| Tear Strength | ISO 1974 | mN | > 250 MD |
| | | | > 250 CD |
| Color Image | - | - | Black |
| Saturation Density | Dynamic test | Macbeth RD914 | 1 min |
| Initiation T° | Heated platen | °C | 75 ± 5 |
| Saturation T° | Heated platen | °C | 85 ± 5 |
| Moisture content | ISO 287 | % | 6.5 ± 1.0 |

## *7.3 APPENDIX 3: Heating time and historical control*

The heating time tables are presented on next pages

The motor cycle time for one dot line is given in the second top line of the table; it is the time for one (or two) motor step(s).
The column 3 (indicated with: speed <xxx mm/s and motor cycle time > xxx ms) gives the required heating time, giving the necessary energy to obtain an optical density of 1.2.

Two areas are then defined in tables:

Area 1: "white"
The motor cycle time for one dot line is greater than the heating time indicated in column 3

Area 2: high lighted
The maximum heating time is greater than the motor cycle time

Note: when the required heating time (function of speed, voltage and temperature) becomes greater than the motor cycle time, printer cannot be operated. This does not occur for xMxx printers at voltages and speeds indicated in this manual.

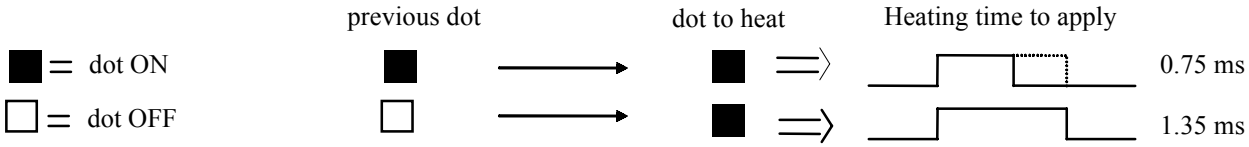
**How to use tables?**
heating time can be controlled either with or without historical control.

- Without historical control: apply the indicated heating time given as a function of speed, voltage and temperature. At high speed, printing quality for isolated dots might be affected with this method.

***Example***: at 70mm/s, 30°C and 24 volts, heating time = 0.6 ms

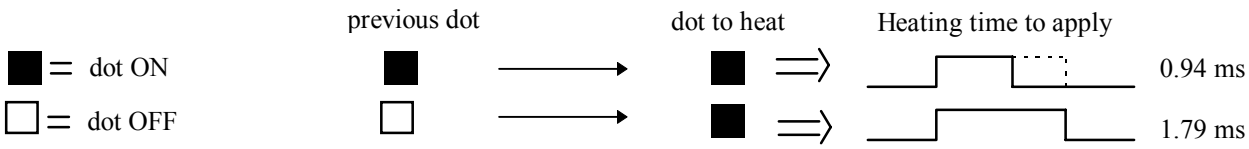
- With historical control in area 1: apply the indicated heating time (function of speed, voltage and temperature) when the dot has been heated on the previous sub line, and the time from column 3 when it has not. This method gives the best printing quality.

***Example***: at 50 mm/s, 20°C and 24 volts:




- With historical control in area 2: apply the indicated heating time (function of speed, voltage and temperature) when the dot has been heated on the previous sub line, and the motor cycle time when it has not. At high speed, printing quality for isolated dots might be slightly affected with this method.

***Example***: at 70 mm/s, 0°C and 22 volts:



Axiohm

**Heating time table (with paper WS 752-57)**

| Voltage (Volts) | Temp °C | Speed (mm/s) | | | R = | 970 Ω | | |
|---|---|---|---|---|---|---|---|---|
| | | <5mm/s | 30 mm/s | 40 mm/s | 50 mm/s | 60 mm/s | 70 mm/s | 75 mm/s |
| | | >25 ms | 4.17 ms | 3.13 ms | 2.5 ms | 2.08 ms | 1.79 ms | 1.67 ms |
| **21** | **-10** | 2.27 | 1.48 | 1.36 | 1.26 | 1.18 | **1.11** | 1.08 |
| **21** | **0** | 2.1 | 1.37 | 1.26 | 1.17 | 1.09 | **1.03** | 1 |
| **21** | **10** | 1.93 | 1.26 | 1.16 | 1.07 | 1 | **0.95** | 0.92 |
| **21** | **20** | 1.76 | 1.15 | 1.06 | 0.98 | 0.92 | **0.87** | 0.84 |
| **21** | **30** | 1.59 | 1.04 | 0.96 | 0.89 | 0.83 | **0.78** | 0.76 |
| **21** | **40** | 1.43 | 0.93 | 0.86 | 0.79 | 0.74 | **0.7** | 0.68 |
| **21** | **50** | 1.26 | 0.82 | 0.75 | 0.7 | 0.66 | **0.62** | 0.6 |
| **22** | **-10** | 2.06 | 1.35 | 1.24 | 1.15 | 1.07 | **1.02** | 0.99 |
| **22** | **0** | **1.91** | **1.25** | **1.15** | **1.06** | **1** | **0.94** | 0.91 |
| **22** | **10** | 1.76 | 1.15 | 1.05 | 0.98 | 0.92 | 0.86 | 0.84 |
| **22** | **20** | 1.61 | 1.05 | 0.96 | 0.89 | 0.84 | 0.79 | 0.77 |
| **22** | **30** | 1.45 | 0.95 | 0.87 | 0.81 | 0.76 | 0.71 | 0.69 |
| **22** | **40** | 1.3 | 0.85 | 0.78 | 0.72 | 0.68 | 0.64 | 0.62 |
| **22** | **50** | 1.15 | 0.75 | 0.69 | 0.64 | 0.6 | 0.56 | 0.55 |
| **23** | **-10** | 1.89 | 1.24 | 1.13 | 1.05 | 0.98 | 0.93 | 0.9 |
| **23** | **0** | 1.75 | 1.15 | 1.05 | 0.97 | 0.91 | 0.86 | 0.84 |
| **23** | **10** | 1.61 | 1.05 | 0.96 | 0.89 | 0.84 | 0.79 | 0.77 |
| **23** | **20** | 1.47 | 0.96 | 0.88 | 0.82 | 0.76 | 0.72 | 0.7 |
| **23** | **30** | 1.33 | 0.87 | 0.8 | 0.74 | 0.69 | 0.65 | 0.64 |
| **23** | **40** | 1.19 | 0.78 | 0.71 | 0.66 | 0.62 | 0.58 | 0.57 |
| **23** | **50** | 1.05 | 0.69 | 0.63 | 0.58 | 0.55 | 0.52 | 0.5 |
| **24** | **-10** | 1.73 | 1.14 | 1.04 | 0.96 | 0.9 | 0.85 | 0.83 |
| **24** | **0** | 1.61 | 1.05 | 0.96 | 0.89 | 0.84 | 0.79 | 0.77 |
| **24** | **10** | 1.48 | 0.97 | 0.89 | 0.82 | 0.77 | 0.73 | 0.71 |
| **24** | **20** | 1.35 | 0.88 | 0.81 | 0.75 | 0.7 | 0.66 | 0.65 |
| **24** | **25** | 1.28 | 0.84 | 0.77 | 0.71 | 0.67 | 0.63 | 0.61 |
| **24** | **30** | 1.22 | 0.8 | 0.73 | 0.68 | 0.64 | 0.6 | 0.58 |
| **24** | **40** | 1.09 | 0.72 | 0.65 | 0.61 | 0.57 | 0.54 | 0.52 |
| **24** | **50** | 0.96 | 0.63 | 0.58 | 0.54 | 0.5 | 0.47 | 0.46 |
| **25** | **-10** | 1.6 | 1.05 | 0.96 | 0.89 | 0.83 | 0.79 | 0.76 |
| **25** | **0** | 1.48 | 0.97 | 0.89 | 0.82 | 0.77 | 0.73 | 0.71 |
| **25** | **10** | 1.36 | 0.89 | 0.82 | 0.76 | 0.71 | 0.67 | 0.65 |
| **25** | **20** | 1.24 | 0.81 | 0.75 | 0.69 | 0.65 | 0.61 | 0.59 |
| **25** | **30** | 1.12 | 0.74 | 0.67 | 0.63 | 0.59 | 0.55 | 0.54 |
| **25** | **40** | 1.01 | 0.66 | 0.6 | 0.56 | 0.52 | 0.49 | 0.48 |
| **25** | **50** | 0.89 | 0.58 | 0.53 | 0.49 | 0.46 | 0.44 | 0.42 |

*Heating time table (with paper WS 752-57) (continued)*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **26** | **-10** | 1.48 | 0.97 | 0.89 | 0.82 | 0.77 | 0.73 | 0.71 |
| **26** | **0** | 1.37 | 0.9 | 0.82 | 0.76 | 0.71 | 0.67 | 0.65 |
| **26** | **10** | 1.26 | 0.82 | 0.75 | 0.7 | 0.66 | 0.62 | 0.6 |
| **26** | **20** | 1.15 | 0.75 | 0.69 | 0.64 | 0.6 | 0.57 | 0.55 |
| **26** | **30** | 1.04 | 0.68 | 0.62 | 0.58 | 0.54 | 0.51 | 0.5 |
| **26** | **40** | 0.93 | 0.61 | 0.56 | 0.52 | 0.48 | 0.46 | 0.45 |
| **26** | **50** | 0.82 | 0.54 | 0.49 | 0.46 | 0.43 | 0.4 | 0.39 |
| **27** | **-10** | 1.37 | 0.9 | 0.82 | 0.76 | 0.71 | 0.67 | 0.66 |
| **27** | **0** | 1.27 | 0.83 | 0.76 | 0.71 | 0.66 | 0.62 | 0.61 |
| **27** | **10** | 1.17 | 0.76 | 0.7 | 0.65 | 0.61 | 0.57 | 0.56 |
| **27** | **20** | 1.07 | 0.7 | 0.64 | 0.59 | 0.56 | 0.52 | 0.51 |
| **27** | **30** | 0.96 | 0.63 | 0.58 | 0.54 | 0.5 | 0.47 | 0.46 |
| **27** | **40** | 0.86 | 0.57 | 0.52 | 0.48 | 0.45 | 0.42 | 0.41 |
| **27** | **50** | 0.76 | 0.5 | 0.46 | 0.42 | 0.4 | 0.37 | 0.36 |

## *7.4 APPENDIX 4: Changing the print head*

The print head kit contains the opto-sensor and the flexible, it is necessary to change the whole kit.

Instructions to change print head:

Remove existing print head

- unscrew chassis
- remove print head springs
- unclip flex
- unclip the opto-sensor and release wires
- unscrew paper feed motor and remove it
- pull out the print head

Fit the new one

- fit the new print head
- fit and screw the paper feed motor
- fit the opto-sensor wires and clip the opto-sensor
- clip the flex cable
- fit the print head springs
- fit and screw the chassis

# 8 PAPER SUPPLIERS

**ARJO WIGGINS** Ref: S752-57 (2320061 in AXIOHM classification)
(see appendix 2 for specifications)

# 9 SPARES

All spare parts kits are supplied as individually packaged loose parts. It is possible to obtain different groups of spare parts kits. AXIHOM customer service will provide the list later.

| Reference | Designation | Contents |
|---|---|---|

*9.1 Cover kits*

| | | |
|---|---|---|
| **3105976** | **COVER KIT WITH CUTTER & MOTOR RMDG FRAME** | *Lot of:* |
| *For Products:* | RMDG1034 - RMDG1034 | Enhanced mini-printer cutter (x1) |

*9.2 Print head kits*

| | | |
|---|---|---|
| **3103169** | **PRINT HEAD KIT C/RMDG 24V** | *Lot of:* |
| *For Products:* | CMDGxxxx | Print head (x1) |

** Screws, washers, rivets and any other small hardware not mentioned in the contents list are supplied with the kits when needed.*

# 10 ACCESSORIES

| Reference | Designation | Contents |
|---|---|---|

*10.1 Flex cable kits*

| | | |
|---|---|---|
| **3106959** | **SHORT FLEX CABLE KIT 30 CONTACTS (180MM)** | *Lot of:* |
| *For Products:* | All CM/RMDLxxxx short flex | 30 contacts 180mm flex cable (x10) |
| **3107044** | **LONG FLEX CABLE KIT 30 CONTACTS (250MM)** | *Lot of:* |
| *For Products:* | All CM/RMDLxxxx long flex | 30 contacts 250mm flex cable (x10) |

# 11 COMSUMABLE PARTS

Available through AXIOHM distributors.

| Reference | Designation | Contents |
|---|---|---|

*11.1 Cleaning kits*

| | | |
|---|---|---|
| **CK60000A** | **CLEANING KIT 60MM AXIOHM (10 units/kit)** | *Lot of:* |
| *For Products:* | All CM/RMDGxxxx | 60mm Cleaning kits (x10) |

*11.2 Thermal papers*

| | | |
|---|---|---|
| **2320061** | **THERMAL PAPER 60MMX30M** | *Lot of:* |
| *For Products:* | All CM/RMDGxxxx | Roll of 60mm x 30M thermal paper (x1) |